

REMARKS

The present Amendment amends claims 22, 23 and 26 and leaves claims 24, 25 and 27- 29 unchanged. Therefore, the present application has pending claims 22-29.

Applicants respectfully request the Examiner to contact Applicants' Attorney, the undersigned by telephone so as to discuss the outstanding issues of the present application prior to examination.

Claims 22-29 stand rejected under 35 USC §102(b) as being anticipated by Martins (U.S. Patent No. 6,950,123). This rejection is traversed for the following reasons. Applicants submit that the features of the present invention as now recited in claims 22-29 are not taught or suggested by Martins whether taken individually or in combination with any of the other references of record. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Amendments were made to the claims to more clearly describe features of the present invention as recited in the claims. Particularly, amendments were made to the claims to recite that the present invention is directed to an object tracking method and object tracking apparatus for implementing the method for detecting and tracking an object in a picked-up image based on an image signal acquired by an imaging unit.

According to the present invention the object tracking method includes producing a template image cut out from the image acquired from the imaging unit so as to include a part of the object, conducting a template matching by calculating correlations between a present image from the imaging unit and

the template image, detecting a position of a part of the present image matched with the template image, and updating position of current template by the detected position, detecting an image changing area between at least two frames of images picked up at different time points by the imaging unit, detecting and updating a position of the object based on the detected image changing area, and updating a template image by an image output as a new template image based on the updated position of the object.

The above described features of the present invention now more clearly recited in the claims are not taught or suggested by any of the references of record whether taken individually or in combination with each other. Particularly, the above described features of the present invention as now more clearly recited in the claims are not taught or suggested by Martins whether taken individually or in combination with any of the other references of record. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw these rejections.

Martins teaches a method for simultaneously tracking multiple bodies in a closed structured environment. Martins teaches in col. 6, lines 1-5 that the field template 224 is applied to clip the region of interest from the difference image. This teaching of Martins means that an image is simply cut out to a shape of a playing field. Thus, this operation does not correspond to an operation of template matching by calculating correlations between a present image and the template image as in the present invention. In Martins, it is not necessary to perform the template matching since a simple cut out operation is performed.

The meaning of the template matching in the present invention is clearly described in the specification on page 6, line 23 to page 10, line 17 no similar description can be found in Martins.

Further, in Fig. 6 of Martins, the computation in the step 226 is neither the correlation calculation nor the template matching so that the difference is acquired from the field model 222 having no players created by using a plurality of frames and the current image 220. Therefore, Martins does not teach or suggest the step of conducting a template matching according to the present invention.

In the step of detecting an image changing area, it seems that the "image changing area" of the present invention may correspond to the "leaving the players clearly identified as blobs" described on col. 6, lines 2-3 in Martins, which does not correspond to the description on col. 6, lines 40-50 of Martins as alleged by the Examiner.

Martins teaches at col. 6, line 58 to col. 7, line 7, that a present position of the object is computed by "visual inspection of the enhanced difference frame". Martins further teaches at col. 7, lines 8-38, that the centroid of a Object's ROI is updated.

However, contrary to the Examiner's allegations, the "Object's ROI" does not correspond to the "template image" of the present invention in that the "template image" already corresponds to the "field template 224" as recited in the template matching. In fact, the "template matching" step is not applied to the "Object's ROI". Therefore, Martins does not teach or suggest that the template image is updated in the detecting and updating step of the present invention as recited in the claims.

In the present invention, two types of algorithms (for template matching and difference oriented detection) are combined so that a position is independently detected. This is because the difference oriented detection is easily confused by a background having movement and a shadow and illumination (particularly at night), whereas the template matching is less susceptible to the foregoing causes because of performing the correlation calculation, which is therefore more suitable for the tracking.

As per the present invention, in the case of template matching, there may be a strong influence from a correlation value among the objects, as the template is updated in accordance with the previously matched position, so that whole objects cannot be overlooked. Further, as per the present invention, the difference method can correct a position detected by the template matching because a position where a difference (or object) is always present is attracted and a correction amount is restricted.

Thus, according to the present invention using the two types of algorithms is much better than using only one of the algorithms. Accordingly, the present invention has an advantage over that taught by Martins of enhanced tracking accuracy.

In contrast, Martins describes the median filtering (thresholded difference in col. 6, line 18) with respect to the field model 222 and the "update track 250" (Fig. 7) with respect to "Object's ROI, which are position detectable algorithms. However, the field model is fixed if it is obtained once because a playing field does not move. On the contrary, the "Object's ROI" is such a player. An object to be detected is quite different. As a result, there is no relationship between the detected results to be corrected with each other.

Thus, Martins fails to teach or suggest producing a template image cut out from the image acquired from the imaging unit so as to include a part of the object, conducting a template matching by calculating correlations between a present image from the imaging unit and the template image, detecting a position of a part of the present image matched with the template image, and updating position of current template by the detected position as recited in the claims.

Further, Martins fails to teach or suggest detecting an image changing area between at least two frames of images picked up at different time points by the imaging unit, detecting and updating a position of the object based on the detected image changing area, and updating a template image by an image output as a new template image based on the updated position of the object as recited in the claims

Therefore, Martins fails to teach or suggest the features of the present invention as now more clearly recited in the claims and as such does not anticipate nor render obvious the claimed invention. Accordingly, reconsideration and withdrawal of the 35 USC §102(b) rejection of claims 22-29 as being anticipated by Martins is respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references utilized in the rejection of claims 22-29.

In view of the foregoing amendments and remarks, applicants submit that claims 22-29 are in condition for allowance. Accordingly, early allowance of claims 22-29 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (500.43348X00).

Respectfully submitted,

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